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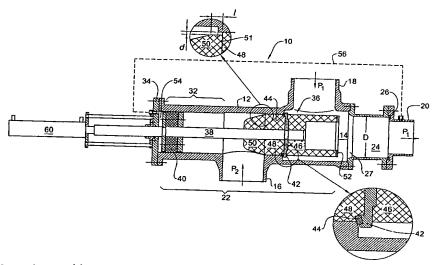
12 June 2003 (12.06.2003) US

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(54) Title: THREE-WAY POPPET VALVE FOR WORK EXCHANGER



(57) Abstract: A three-way two-position poppet valve (10) comprising a housing (12) with a generally cylindrical valve chamber (14), a first (20) and a second (16) port with coaxial 1 valve seats (26, 28) at the ends of the chamber, and a third lateral working port (18). A poppet body (36) is disposed reciprocably in the valve chamber so that in a first position of the poppet body the first valve seat and the second port communicates with the working port, and in a second position the second valve seat (28) is sealed and the first port communicates with the working port. The valve is characterized in that the housing has two coaxial cylindrical passages (24, 30) adjacent the respective valve seats, while the poppet body has two coaxial cylinder parts (44, 48) slidingly and sealingly fitting the cylindrical passages, so that the poppet body is always supported in at least one of the cylindrical passages and fluid communication between the first and the second port is always prevented.

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INTERNATIONAL SEARCH REPORT

International Application No

| | | | FC1/1L2004/0004/1 | | | |
|---|--|-------------------------|--|--|--|--|
| A. CLASSIFICATION OF SUBJECT MATTER IPC 7 F16K11/044 | | | | | | |
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| | o International Patent Classification (IPC) or to both national classification | ation and IPC | | | | |
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| Documentat | ion searched other than minimum documentation to the extent that se | uch documents are incli | uded in the fields searched | | | |
| | | | | | | |
| Electronic d | ata base consulted during the international search (name of data bas | se and, where practical | , search terms used) | | | |
| EPO-In | ternal, WPI Data, PAJ | | | | | |
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| C DOCUM | ENTS CONSIDERED TO BE RELEVANT | | | | | |
| Category ° | Citation of document, with indication, where appropriate, of the rele | nyant naccade | Relevant to claim No. | | | |
| Calegory | Oldion of document, with indication, where appropriate, of the rea | | nelevani to claim No. | | | |
| Α | US 5 306 428 A (TONNER JOHN B) | | 1–19 | | | |
| ^ | 26 April 1994 (1994-04-26) | | 119 | | | |
| | cited in the application | | | | | |
| | the whole document | | | | | |
| A | DE 35 14 899 A (GUR ARIE) | | 1–19 | | | |
| , | 23 January 1986 (1986-01-23) | | | | | |
| | page 6, paragraph 4 — page 9, par | agraph 1 | | | | |
| · | figures | | | | | |
| Α | WO 88/06690 A (TOUR & ANDERSSON A | (B) | 1–19 | | | |
| | 7 September 1988 (1988-09-07) | • | | | | |
| | page 3, paragraph 8 - page 7, par | | | | | |
| | page 11, paragraph 3 - page 13, p 2 | paragraph | | | | |
| | page 14, paragraph 4 - page 16, p | aragraph | | | | |
| | figures 1-9 | | | | | |
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| | | -/ | | | | |
| X Furti | ner documents are listed in the continuation of box C. | χ Patent family r | members are listed in annex. | | | |
| ° Special ca | tegortes of cited documents: | "T" later document pub | olished after the international filing date | | | |
| "A" docume consid | ent defining the general state of the art which is not lered to be of particular relevance | cited to understan | d not in conflict with the application but id the principle or theory underlying the | | | |
| "E" earlier o | document but published on or after the international | | ular relevance; the claimed Invention | | | |
| 'L.' docume | filing date cannot be considered novel or cannot be considered to "L" document which may throw doubts on priority claim(s) or involve an inventive step when the document is taken alone | | | | | |
| which is cited to establish the publication date of another citation or other special reason (as specified) "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the | | | | | | |
| | *O* document referring to an oral disclosure, use, exhibition or other means document is combined with one or more other such document of the means document is combined with one or more other such document of the means document is combined with one or more other such document of the means document of the me | | | | | |
| *P* document published prior to the international filing date but later than the priority date claimed in the art. *&* document member of the same patent family | | | | | | |
| Date of the | Date of the actual completion of the International search Date of mailing of the international search report | | | | | |
| _ | C Contombos 2004 | 00/00/0 | 2004 | | | |
| | 6 September 2004 | 28/09/2 | :004 | | | |
| Name and n | Name and mailing address of the ISA Authorized officer Authorized officer | | | | | |
| Ī | European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, | | | | | |
| | Fax: (+31-70) 340-2040, 1x: 31 651 epo III, | Ceuca, | A-N . | | | |

INTERNATIONAL SEARCH REPORT

International Application No
T/IL2004/000471

| | tion) DOCUMENTS CONSIDERED TO BE RELEVANT | | | |
|------------|---|-----------------------|--|--|
| Calegory ° | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. | | |
| 1 | DE 195 40 580 A (HONEYWELL AG) 7 May 1997 (1997-05-07) the whole document | 1-19 | | |
| Α | US 5 306 429 A (CALTON GARY J ET AL) 26 April 1994 (1994-04-26) cited in the application the whole document | 1 | | |
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

| | atent document d in search report | } | Publication date | | Patent family member(s) | Publication date |
|----|--------------------------------------|---|---------------------|----------|----------------------------|-----------------------------|
| US | 5306428 | Α | 26-04-1994 | NONE | - | |
| DE | 3514899 | Α | 23-01-1986 | IL DE | 72458 A 3514899 A1 | 12-07-1990 23-01-1986 |
| | | | | ES JP | 8607517 A1 61031899 A | 01-11-1986 14-02-1986 |
| WO | 8806690 | Α | 07-09-1988 | SE AU | 456689 B 1424388 A | 24-10-1988 26-09-1988 |
| | | | | DK EP | 606888 A , 0418222 A1 | |
| | | | | FI NO | 88821 B 884855 A , | 31-03-1993 B, 01-11-1988 |
| | | | | SE WO | 8700924 A 8806690 A1 | 06-09-1988 07-09-1988 |
| DE | 19540580 | Α | 07-05-1997 | DE | 19540580 A1 | 07-05-1997 |
| US | 5306429 | Α | 26-04-1994 | AU | 688284 B2 | 12-03-1998 24-05-1994 |
| | | | | AU CA | 5408994 A 2146358 A1 | 11-05-1994 |
| | | | | EP JP | 0666835 A1 8502690 T | 16-08-1995 26-03-1996 |
| | | | | WO | 9410096 A1 | 11-05-1994 |

Corrected Version

INTERNATIONAL SEARCH REPORT

International Application No
PCT/11/2004/000471

| | | , | PC1/1L2004/0004/1 | | |
|--|---|--|--|--|--|
| A. CLAS | SIFICATION OF SUBJECT MATTER F16K11/044 | | | | |
| | to International Patent Classification (IPC) or to both national cl | assification and IPC | | | |
| | S SEARCHED documentation searched (classification system followed by clas- | Total Control Control | | | |
| IPC / | F16K B01D | , | | | |
| | ation searched other than minimum documentation to the extent | | | | |
| | nternal, WPI Data, PAJ | | carariems aseu) | | |
| | ENTS CONSIDERED TO BE RELEVANT | | | | |
| Category ° | Citation of document, with indication, where appropriate, of the | ne relevant passages | Relevant to claim No. | | |
| A | US 5 797 429 A (SHUMWAY ET AL) 25 August 1998 (1998-08-25) column 5, line 21 - column 8, figures | 1-19 | | | |
| Α | US 5 306 428 A (TONNER JOHN B) 26 April 1994 (1994-04-26) cited in the application the whole document | 1-19 | | | |
| A | DE 35 14 899 A (GUR ARIE) 23 January 1986 (1986-01-23) page 6, paragraph 4 - page 9, figures | paragraph 1 | 1-19 | | |
| | | -/ | | | |
| | | | | | |
| X Furthe | er documents are listed in the continuation of box C. | X Patent family mem | bers are listed in annex. | | |
| Special cate | gories of cited documents : | | | | |
| consider | t defining the general state of the art which is not red to be of particular relevance cument but published on or after the international | cited to understand the invention | ed after the international filing date tin conflict with the application but a principle or theory underlying the | | |
| filing date discrete which may throw doubts on priority claim(s) or which is cited to establish the publication date of another clatton or other special reason (as specified) | | "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention | | | |
| O" document other me | t referring to an oral disclosure, use, exhibition or | document is combined | o involve an invention of involve an invention of involve an inventive step when the with one or more other such docu- on being obvious to a person skilled | | |
| later than | n the priority date claimed | "&" document member of th | | | |
| | tual completion of the international search April 2005 | Date of mailing of the in | ternational search report | | |
| | iling address of the ISA | <u> </u> | 2 9 APR 2005 | | |
| and mai | ming audress of me 15A European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk | Authorized officer | | | |
| | Tel. (+31-70) 340-2040, Tx. 31 651 epo nl. Fax: (+31-70) 340-3016 | Ceuca, A-N | | | |

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/IL2004/000471

| C.(Continu | ation) DOCUMENTS CONSIDERED TO BE RELEVANT | PCT/IL2004/000471 |
|------------|---|-----------------------|
| Category ° | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
| A | WO 88/06690 A (TOUR & ANDERSSON AB) 7 September 1988 (1988-09-07) page 3, paragraph 8 - page 7, paragraph 2 page 11, paragraph 3 - page 13, paragraph 2 page 14, paragraph 4 - page 16, paragraph 2 figures 1-9 | 1-19 |
| A | DE 195 40 580 A (HONEYWELL AG) 7 May 1997 (1997-05-07) the whole document | 1-19 |
| A | US 5 306 429 A (CALTON GARY J ET AL) 26 April 1994 (1994-04-26) cited in the application the whole document | 1 |
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Corrected Version

INTERNATIONAL SEARCH REPORT

International Application No PCT/IL2004/000471

| | | | ·· | PC1/1L2 | 004/000471 |
|--|-------------|------------------|--|---|--|
| Patent document cited in search report | | Publication date | | Patent family member(s) | Publication date |
| US 5797429 | A | 25-08-1998 | EP IL WO | 0895567 A2 126186 A 9736124 A2 | 10-02-1999 20-05-2001 02-10-1997 |
| US 5306428 | Α | 26-04-1994 | NONE | | |
| DE 3514899 | Α | 23-01-1986 | IL DE ES JP | 72458 A 3514899 A1 8607517 A1 61031899 A | 12-07-1990 23-01-1986 01-11-1986 14-02-1986 |
| WO 8806690 | А | 07-09-1988 | SE AU DK EP FI NO SE WO | 456689 B 1424388 A 606888 A ,B, 0418222 A1 88821 B 884855 A ,B, 8700924 A 8806690 A1 | 24-10-1988 26-09-1988 01-11-1988 27-03-1991 31-03-1993 01-11-1988 06-09-1988 |
| DE 19540580 | Α | 07-05-1997 | DE | 19540580 A1 | 07-05-1997 |
| US 5306429 | A | 26-04-1994 | AU AU CA EP JP WO | 688284 B2 5408994 A 2146358 A1 0666835 A1 8502690 T 9410096 A1 | 12-03-1998 24-05-1994 11-05-1994 16-08-1995 26-03-1996 11-05-1994 |